

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

2A
U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 411

REV. JUNE 1916.]

FEEDING HOGS IN THE SOUTH.

BY

DAN T. GRAY,

*Professor of Animal Industry, Alabama Polytechnic Institute;
Expert in Animal Husbandry, Bureau of Animal Industry.*



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1917.



CONTENTS.

	Page.
Introduction.....	5
Too much corn feeding not profitable.....	6
The sow and the sucking pigs.....	8
Shelter.....	8
Feed for sow before farrowing.....	9
Feed for sow after farrowing.....	10
Feed for pigs before weaning.....	11
Weaning the pigs.....	12
Concentrates to supplement corn.....	13
Dairy by-products.....	13
Cowpeas and soy beans.....	15
Rice feeds.....	16
Middlings.....	18
Tankage and meat meal.....	19
Cotton-seed meal.....	20
Pasture crops to supplement corn.....	21
Permanent pastures.....	22
Rape pasture.....	23
Chufas.....	24
Plants for winter pasture.....	25
Plants for summer pasture.....	25
Cowpeas as a grazing crop.....	26
Soy-bean pasture.....	27
Peanuts.....	29
Alfalfa.....	31
Sorghum.....	32
Amount of grain to feed when hogs are on pasture.....	34
Root and tuber crops.....	36
Crop succession for hog feeding.....	38
Finishing hogs after pasture crops are exhausted.....	38
Increase in soil fertility due to grazing hogs.....	39
Conclusions.....	40

ILLUSTRATIONS.

	Page.
FIG. 1. Lovejoy portable hog house, end elevation.....	9
2. Bonham portable hog house.....	10
3. Bonham portable hog house, showing plan of construction.....	11

FEEDING HOGS IN THE SOUTH.

INTRODUCTION.

The southern people are large meat consumers, but small meat producers. In fact, the South consumes more meat per capita than any other section of our country, but a large proportion of this meat is shipped into the South from other sections of the country. To give an instance, during the year 1907 there were but 15,151 home-raised animals slaughtered in the city of Birmingham, Ala. (this includes cattle, veal, hogs, sheep, and kids), while there were 36,097 live western animals brought into the city and slaughtered. In addition to these western live animals brought into the city, there were 5,781,470 pounds of fresh meat shipped in and sold, as well as thousands of pounds of western cured meat.^a This means that more than a million dollars go out of the city of Birmingham alone each year into distant States for meats, and this money could all be kept at home if the southern farmer would but produce the meat.

Pork can be made as cheaply, and perhaps more cheaply, in the South than in any other section of the country. And there are many reasons why our southern farmers should introduce this line of animal production into their farming system. One of these reasons is mentioned above—the money spent for meat by the southern people would be kept at home. Another is the influence it would probably have on the price of cotton. It will never be possible for the South to control the price of cotton until the southern farmer places himself in such a position that he can hold the crop after it is produced. So long as all the farmers are required to sell the entire crop of cotton each fall, so long will its price be an unreliable and unstable one. The only way by which the farmer can place himself in a position where he will not have to sell all his cotton each fall is to produce something in addition to cotton; and unquestionably one of the best supplements to the cotton crop would be the raising of hogs. The hog business can be so managed that the owner can have money coming in from it at least twice a year, which would enable him to hold his cotton as long as he pleases.

^aThis information was furnished by Mr. E. M. Duncan, city bacteriologist and chief of meat and milk inspection of Birmingham, Ala.

Furthermore, the hog is especially adapted to the farmer with small capital, as but a small amount of money is required with which to begin the business, and returns begin to come in within a few months after it is started. The sow is a rapid producer. Money is turned rapidly. With \$125 invested in 1 boar and 5 to 8 sows it is easily possible to have for sale from 5,000 to 8,000 pounds of pork (live weight) in a year. In other words, the yearly sales should be from two to four times the amount of investment.

TOO MUCH CORN FEEDING NOT PROFITABLE.

It is sometimes claimed that hogs can not be raised and finished at a profit in the South since corn has advanced in price. The farmer is often told that he can buy his pork cheaper than he can make it. While pork has not advanced in price as rapidly as has corn, still it must be remembered that the cheapest side meat costs the consumer from 14 to 15 cents a pound, and that the shoulders and hams cost from 18 to 22 cents a pound. It is no doubt true that the southern farmer who imitates his northern brother in his pork-making operations could buy the meat cheaper than he could make it. But if he takes his own conditions as he finds them and uses these conditions intelligently, he can produce pork cheaper than it is possible to produce it in other sections. But he can not compete with those portions of the country where corn is comparatively cheap if he also feeds corn alone. The southern farmer must economize in the use of this feed on account of its high price. The South, in fact, feeds too much corn, as a sole feed, to hogs; there are cheap feeds which should be used along with corn.

It is generally considered that there is no other feed equal to corn for pork production. This is true, provided the corn is used judiciously. But if it be fed alone for any length of time there are few feeds which are poorer, as the experiments described below strikingly demonstrate. If, however, corn is fed in combination with other feeds, its use is to be highly commended, and it can be used to great economical advantage, too, even though it sells upon the market as high as \$1 a bushel.

The hog is not adapted to living on corn alone, and when we require it of him we are forcing him to do a thing which is not consistent with his nature. Man likes a mixture of feeds or a change in diet; so do the lower animals. The hog in its wild state is omnivorous, feeding upon roots, nuts, fish, grass, fruit, snakes, etc.; in fact, but few feeds can be mentioned that he will not eat if he be given the opportunity. Our domesticated hogs have inherited the tendency to select their feed from a variety of substances, and when we inclose them in a pen

and give but one feed we can feel assured that we are not allowing them to reach their highest possibilities.

Probably those who claim that pork can not be produced in the South at a profit mean that it can not be produced on corn alone at a profit; if so, that is entirely correct. Experimental data show that pork can not be profitably raised and finished upon corn alone when corn sells for 70 cents a bushel. The following table, which includes feeding experiments from several Southern and Western States, clearly demonstrates the fact that the man who tries to finish hogs on corn alone is following a losing business:

TABLE 1.—*Feeding experiments showing effects of fattening hogs on corn alone.^a*

Station.	Number of pigs.	Length of experiment.	Average daily gains.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain when corn is—			
					40 cents.	50 cents.	60 cents.	70 cents.
		Days.	Pounds.					
Texas.....	10	83	0.46	762	\$5.44	\$6.80	\$8.15	\$9.52
Do.....	10	83	.43	868	6.20	7.75	9.30	10.85
Tennessee.....	3	60	1.00	460	3.88	4.10	4.93	5.75
Do.....	3	60	1.00	416	2.97	3.72	4.46	5.20
Do.....	7	.....	.50	410	2.93	3.60	4.39	5.12
Alabama.....	3	60	.....	806	5.76	7.20	8.63	10.07
Do.....	3	35	.....	670	4.79	5.98	7.18	8.37
Do.....	3	56	.40	621	4.43	5.54	6.65	7.76
Do.....	15	96	.69	611	4.36	5.45	6.55	7.64
Indiana.....	3	70	1.56	432	3.09	3.86	4.63	5.40
Do.....	4	127	.67	520	3.72	4.65	5.57	6.50
Do.....	10	30	1.40	443	3.16	3.96	4.75	5.54
Do.....	4	85	.55	557	3.98	4.98	5.97	6.96
Oklahoma.....	4	126	.62	470	3.36	4.19	5.03	5.87
Do.....	4	84	.50	560	4.00	5.00	6.00	7.00
Do.....	5	55	.63	801	5.72	7.15	8.58	10.01
Iowa.....	6	49	2.08	461	3.29	4.12	4.95	5.74
Wisconsin.....	35	.....	1.69	459	3.28	4.09	4.87	5.74
Do.....	35	.....	1.41	499	3.57	4.45	5.35	6.24
North Carolina.....	5	90	.18	1,284	9.17	11.46	13.75	16.04
Virginia.....	8	90	.24	1,263	9.02	11.28	13.55	15.79
Colorado.....	4	104	.70	538	3.84	4.80	5.76	6.72
Nebraska.....	4	119	.95	593	4.16	5.21	6.25	7.29
Do.....	29	84	1.05	452	3.23	4.04	4.84	5.65
Wyoming.....	3	77	.99	485	3.46	4.33	5.20	6.06
Ohio.....	6	66	.57	618	4.42	5.52	6.62	7.73
Average.....	.....	.....	.....	580	4.15	5.18	6.21	7.25

^a Taken from Alabama Experiment Station Bulletin 143.

The varying amounts of corn necessary to make 100 pounds gain as shown in Table 1 may be due to one of many causes, such as differences in breed, in the quality of the individuals, in the size of the pigs at the beginning, in the length of the experiment, in the climatic conditions, in the seasons of the year, etc.^a The farmer, under ordinary conditions, however, will not vary much from the above averages. The table shows that when corn is worth 70 cents a bushel the cost of each pound of gain will be just about 7 cents; when corn

^a Similar variations will be noticed in the figures for other feeds as given in succeeding tables, and these variations may be explained in the same way.

is selling at 60 cents a bushel each pound of gain put on will cost 6 cents; when corn is worth 50 cents a bushel each pound of gain will cost 5 cents; and when corn is worth only 40 cents a bushel pork can be finished for only 4 cents a pound. It appears, therefore, that when 70-cent corn is fed to 5-cent hogs the feeder is losing 20 cents a bushel on his corn. Seven-cent pork must go along with 70-cent corn if the owner is to strike even on feeding corn alone. As a general thing the farmers do not get 7 cents for their hogs. If corn were worth but 40 cents a bushel, as it often is in some of the Western States, it would be a very profitable thing to raise corn and feed it to 5 and 6 cent hogs; good money could be made out of it, as the farmer would then be selling his 40-cent corn, by means of hogs, at 50 to 60 cents a bushel. But even in the corn-belt States it is more profitable to supplement the corn with other concentrates or green crops, and this practice is followed by the best farmers.

THE SOW AND THE SUCKING PIGS.

To produce good, strong, healthy pigs they must be looked after before they are born. The mother while pregnant must be cared for and fed properly if she is to give birth to a good litter of pigs. As a rule the mother is neglected during the period of pregnancy, the owner seeming to think that the application of care and feed after she has farrowed is all that is required. But we should know that a poorly nourished pregnant mother means a weak, sickly litter of pigs.

SHELTER.

In the South, the far South especially, very little shelter is needed except at farrowing time. There is no occasion for expensively constructed buildings. Of course, at farrowing time the mother should always be supplied with a building that will afford shelter from the rain and the wind for both the mother and the pigs until the pigs become dry. If the wind strikes the young pigs when they are first born they will often chill to death. Each farmer can make his own shelter, to be in keeping with his surroundings, but probably the best and most economical building that can be made is the portable hog house (figs. 1, 2, and 3). These houses may vary in size; those with floor dimensions of 6 by 8 feet, 6 by 9 feet, or 8 by 8 feet will be found most satisfactory. The roof need not be over 7 feet high at the highest point. The house may be made on runners to facilitate moving it about. To prevent the sow from crushing the pigs at farrowing time, a scantling should be fastened to the inside of the house, about 8 inches from the ground, projecting about 10 inches toward the center of the pen. The small pigs can run under

this protection and keep the mother from lying upon them. There is no necessity for supplying a floor for these houses; some straw at farrowing time is all that is required.

FEED FOR SOW BEFORE FARROWING.

It will be shown later on that pastures are the basis for the profitable handling of hogs. The pigs should be gotten up to weaning time as cheaply as possible, and the cheapest way to do this is to have a pasture for the sows to run upon every month in the year. It is very little trouble to have pastures practically the year round in the South. (See pp. 22-34.) Of course the sow should be provided with some grain in addition to the pasture, but the pastures will save a great amount of grain. It must be remembered that the sow must be nourished in such a way that the pigs will come into the world strong and healthy. Corn alone will not keep the sow in a good healthy condition, neither will it develop the pigs in the mother's body. But corn along with a good leguminous pasture will provide her with a good ration. When pastures are not available such feeds as skim milk and bran should be used along with the corn. Not more than one half of her ration should ever be made up of corn; the other half should be made up of a feed that will furnish plenty of ash and protein to build up the litter of pigs in the body. Leguminous pastures are the cheapest feeds that can be found to go along with the corn. With a good leguminous pasture the sow will be maintained in good flesh when she is fed a ration of corn equivalent to 1 per cent of her live weight. For a 200-pound sow this would be 2 pounds of corn daily. When no pasture is provided it requires from 6 to 7 pounds of grain to maintain a 200-pound sow in proper condition.

Some farmers make use of a leguminous hay for the sows when the pastures become short. Alfalfa, cowpea, and soy-bean hay are

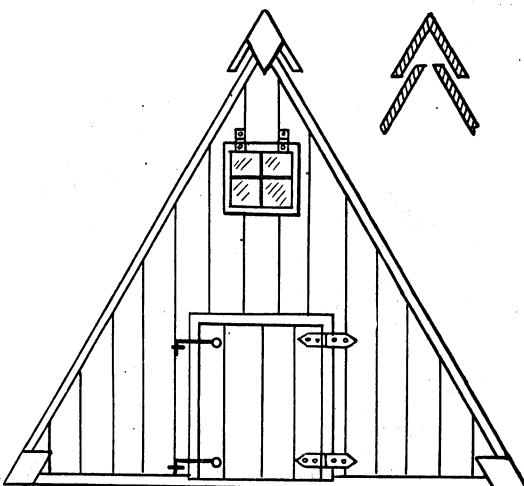


FIG. 1.—Lovejoy portable hog house, end elevation.

all good for this purpose. They save a great amount of grain. When the farm is supplied with a cutter it will pay to cut the hay into small parts, which should be mixed with the corn and fed as a thick slop. But it will not pay to go to any extra expense to get ready to cut this hay. Some feeders throw the uncut hay on the ground, but this causes considerable waste, especially in rainy weather. In the South, where hay is high in price, it will pay to provide a small rack so that the animals can pull the hay from below without getting it under their feet.

If neither pastures nor hay are available, the feeder should use corn along with wheat shorts, bran, tankage, skim milk, etc. Corn should never be used alone. Corn and skim milk should be fed in the proportion of one part of corn to three parts of skim milk. Under average conditions the dry sow should be fed about one part of

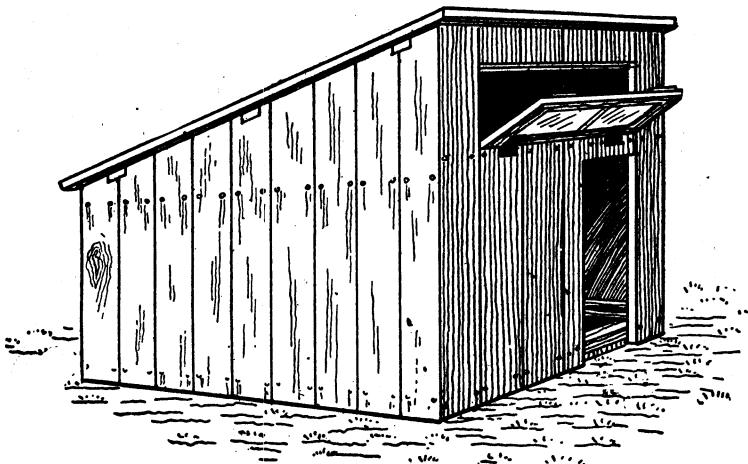


FIG. 2.—Bonham portable hog house.

shorts or bran to three parts of corn, or one part of tankage to nine parts of corn. It would pay some farmers to use cowpeas and soy beans along with the corn in the proportion of one part of the peas to about six parts of corn.

FEED FOR SOW AFTER FARROWING.

The mother should receive no feed at all for about twenty-four hours after giving birth to the pigs. She is feverish, though, and should be liberally supplied with fresh water. The second day after farrowing she should be given a small feed. It is well to start her on a light slop made up of shorts and skim milk. If there is no skim milk on hand, mix about four parts of corn with one part of shorts, cowpeas, or soy-bean meal and give a small quantity. She should be

gradually brought up to a full feed; this should require about three weeks. If she is overfed at first the pigs are apt to take scours and thumps. When she is on full feed she will be eating daily an amount equivalent to about 4 per cent of her live weight, provided she is not on pasture. If she has the run of a good leguminous pasture, at least one-half of the grain will be saved. If she has no pasture, she should be fed just about as she was fed before farrowing, except that she should receive more feed than when she was dry. When the pasture is composed mainly of blue grass or Bermuda grass she should receive a grain feed equivalent to about 3 per cent of her live weight, and the grain part of the ration should be partly composed of shorts, tankage, cowpeas, or soy beans. When the pasture is made up of a leguminous crop, a grain ration equivalent to not more than 2 per cent of her body weight will keep her in excellent flesh, and in this case corn can be used for the grain portion of the feed.

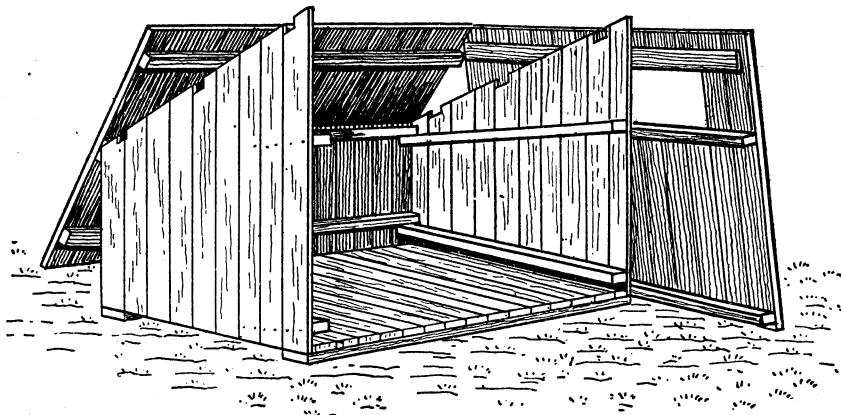


FIG. 3.—Bonham portable hog house, showing plan of construction.

FEED FOR PIGS BEFORE WEANING.

Here, again, the most important point of all, as far as economy of gains is concerned, is to have a pasture for the pigs to run upon as soon as they begin to eat. When a good pasture is available and the mother is fed liberally of the proper feeds, the little pigs will need little in addition to what they obtain from the pasture and the mother. But the pigs will make use of some additional feed, especially if the litter is a large one. The pigs will begin to eat when they are about 3 weeks old if they be given the opportunity. For these young animals nothing is superior to skim milk mixed with shorts. Many farmers have no skim milk, though, so something else must be used. In such case probably the best thing to feed is a thin slop of shorts up to the time that the pigs are from 4 to 6 weeks old, after which

the ration should be made up of equal parts of corn meal and shorts. These young animals should never be fed corn alone. The feed for the pigs must be fed in separate troughs, around which a fence has been built to keep the sows away.

There is no advantage to be gained by pushing the pigs too rapidly with supplementary feeds. They should not be fed much fattening feeds, as corn; they should rather be given feeds which tend to make bone and muscle, as skim milk, shorts, pasture, cowpeas, soy-bean meal, etc., so that when the time arrives to finish them for the market they will have a well-developed body upon which to put the fat. They should, while young, be given just enough feed to keep them in a good healthy growing condition.

Oftentimes when the litter is small and the mother is a good milker the little pigs will need no feed at all in addition to the pasture and the mother's milk. The Wisconsin station ^a has done some experimental work which seems to show that gains on young pigs can be made as economically by feeding a given amount of feed to the mother as by feeding directly to the pigs. To be able to keep up an average-sized litter in this way, the mother must be fed liberally. The mother and the pasture should be depended upon to furnish the greater part of the feed for the small pig.

WEANING THE PIGS.

Some farmers make the mistake of weaning the pigs too young. The age at which they should be weaned depends somewhat upon whether the mother is to produce two litters a year. However, the pigs should never be taken away from the mother under 8 weeks of age; it is usually advisable to let them run with the sow until they are from 10 to 12 weeks old. The mother's feed at weaning time should be reduced to pasture alone for a few days, so that the flow of milk will be checked; if full feed is continued when the pigs are weaned, the mother's udders and teats are apt to be ruined. The milk flow will dry up within a few days, and if the sow is thin the feed should be raised some, but she will not require as much feed as when she was suckling the litter of pigs.

The pigs should be accustomed to feeds before they are taken from the mother. If they are weaned before they are thoroughly acquainted with some concentrated feeds, they are sure to be seriously checked in their growth. The farmer who has some skim milk will experience no difficulty at all in carrying the pigs through this period, as the skim milk, with the proper grain ration, takes the place of the mother's milk. It is necessary for the pigs at this time

^a Wisconsin Experiment Station Reports, 1889 and 1890.

to be supplied with a good pasture, a leguminous pasture preferred. Alfalfa affords one of the best pastures obtainable for young pigs. With a good pasture and a half ration of grain they will make good and profitable gains up to the time they are ready to finish for the market.

CONCENTRATES TO SUPPLEMENT CORN.

It has previously been shown that the southern farmer can not afford to use corn alone as a fattening ration for swine. Fortunately for the South, it is not necessary to depend upon corn alone, as almost all the crops which can be grown in any part of the country can be grown in the South, and there are many crops suitable for hog feed which can be grown in no other section of the country. This section is wonderfully blessed in its great variety of grain and concentrates, and in addition green and pasture crops can be made to spread over 12 months of the year. In fact, with the use of pasture crops the South is in a position to make pork cheaper than any other section of the United States.

As stated before, the hog likes a variety of feeds and thrives better upon a ration made up of two or more feeds than upon one made up of but one. It has been proved by several of the experiment stations that wheat and corn, when fed separately to fattening hogs, are practically equal in feeding value. At the Wisconsin Experiment Station several tests were made to learn the relative value of wheat and a mixture of wheat and corn in equal parts. It was found that 500 pounds of wheat were required to make 100 pounds of gain, but when wheat and corn were fed in equal parts only 485 pounds of the mixture were required to make the same gain. When fed separately, these grains are of equal feeding value, but the mixture of the two was more valuable than either grain when fed alone. While the South has not the wheat, yet the Wisconsin experiments teach the lesson that if the most is to be realized upon the hog and the corn a supplementary feed must go along with the corn.

DAIRY BY-PRODUCTS.

Among the various concentrated supplements which can be used with corn for fattening hogs are the dairy by-products—skim milk and whey. Of course at the present time the South has but little dairy by-products to use in finishing hogs, but as the dairy business assumes greater proportions much larger amounts of these valuable feeds will be at the disposal of the hog feeder. It is probable that the skim milk and whey could be used to better advantage in feeding the suckling mothers and the small pigs, as the green pasture crops can take their place after the pigs are weaned, but still there are cases where it

should be fed to the fattening animals. The value of these feeds can be seen from the following experiments:

TABLE 2.—*Experiments showing value of skim milk in feeding hogs.*

Station.	Ration.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Alabama ^b	Corn alone.....	670	\$8.38
	Corn, 1 part..... Skim milk, 2.2 parts.....	210 465	4.02
Tennessee ^c	Corn alone.....	410	5.12
	Corn, 1 part..... Skim milk, 7.4 parts.....	160 1,190	5.57
Missouri ^d	(Corn..... Skim milk.....)	243 559	4.71
	Corn, 3 parts..... Middlings, 2 parts.....	310 207	6.98
Tennessee ^e	Corn alone.....	467	5.84
	Corn, 1 part..... Skim milk, 5.3 parts.....	211 1,122	6.00
Tennessee ^e	Corn alone.....	1,263	15.79
	Corn, 1 part..... Skim milk, 4 parts.....	186 746	4.56

^a Price of feeds: Corn, 70 cents a bushel; skim milk, 30 cents a hundredweight; middlings, \$30 a ton.

^b Bulletin 82.

^c Bulletin 167.

^d Bulletin 79.

^e Bulletin, Vol. XV, No. 1.

It is seen that the skim milk was very profitably used except in those cases where the larger amounts were fed. When skim milk is valued at 30 cents a hundredweight, as it is in the table, it must be used in limited amounts in conjunction with the corn. So far as economy of gains is concerned, poor results were secured when from five to seven parts of skim milk were fed to one part of corn; but when only two or three parts of milk were fed to one part of grain the results were always satisfactory. Even though too large amounts of milk were fed in some of the above tests—that is, when valued at 30 cents a hundredweight—the average result of the Alabama and Tennessee work shows it to have a feeding value of 71.7 cents a hundredweight when corn is worth 70 cents a bushel. In the Missouri work, where both corn and middlings were fed in the check lot, the skim milk proved to have a value of 70.4 cents a hundredweight.

As a rule, all kinds of dairy products, even the skim milk, command a very high price when offered to the public in the southern markets. Many dairymen could not afford to feed skim milk to the hogs. But there are many other dairymen who are situated in such a manner as to have no outlet at all for the skim milk made upon the farm as far as selling it upon the market is concerned. Many farmers

consider this feed as almost a waste product and treat it as such, but if it is properly apportioned with the grains and given to hogs, it can be disposed of, through the hogs, for an excellent price. The hog, therefore, is a valuable adjunct to the dairy business as a means of utilizing the waste or by-products.

COWPEAS AND SOY BEANS.

In the past, when the cowpea and the soy bean sold at cheap prices, some farmers used them in large amounts in hog-feeding operations. But they have advanced in price within the last few years and at the present time must be used in limited amounts. When they are valued at \$1.50 a bushel neither one can be used as freely as was the case in the following tests:

TABLE 3.—*Experiments with cowpeas (the seed) to supplement corn in feeding hogs.*

Station.	Ration.	Pounds of grain to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Alabama ^b	Corn alone.....	487	\$6.09
	Cowpeas alone.....	481	12.02
	Corn, one-half.....	216	8.10
	Cowpeas, one-half.....	216	
Alabama ^c	Corn alone.....	478	5.97
	Corn.....	187	7.54
	Cowpeas.....	208	

^a Price of feeds: Corn, 70 cents a bushel; cowpeas, \$1.50 a bushel. ^b Bulletin 82. ^c Bulletin 143.

When fed in the above amounts the cowpeas proved to be worth but 94 cents a bushel in the first experiment and \$1.04 a bushel in the second test. In the first test 216 pounds of cowpeas took the place of 271 pounds of corn, and in the second 208 pounds of cowpeas were equal to 291 pounds of corn. Money, of course, was lost as a result of feeding cowpeas in these large amounts. Cowpeas are too high in price to make up any considerable amount of the hog's ration. The above results do not, however, prove that cowpeas can not be used in a ration where they make up a smaller proportion of the whole. If they are to be used along with corn they should not make up more than about one-fifth of the whole ration. When so used they will cheapen the corn ration. When a feed is worth in the neighborhood of \$50 a ton it must be used intelligently.

Some of the experiment stations have tried to ascertain the value of the soy bean as a feed with which to supplement corn. This bean is richer than the cowpea, so it has not been fed in as large amounts as has the cowpea. It has proved superior to the cowpea for feeding hogs, probably not so much because of its superiority

as a feed, but because it was fed so as to make up a smaller proportion of the whole ration. The cowpea has been used too lavishly.

The Kansas and Indiana stations have tested soy beans as a supplemental feed, with the following results:

TABLE 4.—*Experiments with soy beans (the seed) to supplement corn in feeding hogs.*

Station.	Ration.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Kansas ^b	Corn alone.....	482	\$6.03
	Corn, two-thirds.....	246	
	Soy-bean meal, one-third.....	123	6.15
Indiana ^c	Corn meal, 6.5 parts.....	328	
	Linseed meal, 1 part.....	57	4.95
	Corn meal, 6.1 parts.....	310	
Indiana ^d	Soy-bean meal, 1 part.....	51	5.15
	Corn alone.....	557	6.96
	Corn, two-thirds.....	207	
	Soy beans, one-third.....	103	5.18

^a Price of feeds: Corn, 70 cents a bushel; soy beans, \$1.50 a bushel; linseed meal, \$30 a ton.

^b Bulletin 95.

^c Bulletin 126.

^d Bulletin 108.

The Kansas test shows 123 pounds of soy-bean meal to be equal to 236 pounds of corn when fed in the proportion of one-third soy-bean meal to two-thirds corn. Or, 1 bushel of soy beans proved to be worth \$1.44 for hog feeding. In the first Indiana test soy-bean meal proved to be somewhat superior to linseed meal. Or, when corn sells for 70 cents a bushel and hogs for 5 cents a pound, the soy beans were worth \$1.33 a bushel as a feed. If the hogs sell at 6 cents a pound the beans were then worth \$2.51 a bushel. In the second Indiana test the soy beans realized, through hogs, \$2.54 a bushel.

If the cowpea or the soy bean are either one to be used in conjunction with corn they must be used sparingly—in the same way that packing-house by-products are used—and when thus used excellent prices can be realized upon them with hogs selling at 5 or 6 cents a pound live weight. It has been but a few years since cowpeas could be bought at from 50 to 75 cents a bushel. If the price ever returns to these figures the farmer can afford to make larger use of the cowpea—that is, financially. In other words, he could afford to feed them in equal proportion with corn, but would gain little by so doing except to save corn.

RICE FEEDS.

In some sections of the South rice products can be used to advantage as a hog feed, especially in parts of South Carolina, Arkansas, Louisiana, and Texas. As time goes by there will be more and

more of these by-products thrown upon the market, as the area devoted to rice culture is rapidly increasing. In 1899 there were but 342,214 acres planted to rice, while in 1905 the acreage had increased to 482,479, and the area suited to rice culture is being extended every year. In some of the tests reported below where rice polish was compared directly with corn meal, the rice by-product was found to be superior to corn, pound for pound. Two southern experiment stations have carried on work to learn the value of the rice feeds, with the following results:

TABLE 5.—*Experiments showing value of rice by-products for feeding hogs.*

Station.	Ration.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
South Carolina ^b	Rice meal, 1 part.....	248	\$5.70
	(Skim milk, 4 parts.....	991	
Alabama ^c	Corn meal, 1 part.....	257	6.30
	Skim milk, 4 parts.....	1,028	
Alabama ^c	Rice polish.....	373	4.10
	Corn meal.....	474	5.93
Alabama ^c	Corn hearts, one-half ^d	369	7.19
	Rice bran, one-half.....	369	
Alabama ^c	Cowpeas, one-half.....	297	9.51
	Rice bran, one-half.....	297	
Alabama ^c	Corn meal, one-half.....	275	5.36
	Rice bran, one-half.....	275	
Massachusetts ^e	Rice meal.....	225	5.22
	(Skim milk.....	914	
Massachusetts ^e	Corn meal.....	225	5.55
	Skim milk.....	912	

^a Price of feeds: Corn, 70 cents a bushel; skim milk, 30 cents a hundredweight; rice bran, \$14 a ton; rice meal, \$22 a ton; corn hearts, \$25 a ton.

^b Bulletin 55.

^c Bulletin 122.

^d Corn hearts was a commercial by-product consisting of the hearts mixed with the corn bran.

^e Report, 1897.

In the South Carolina test the rice meal proved to be worth \$16.36 a ton with hogs selling for 5 cents a pound and skim milk at 30 cents a hundredweight, and \$24.42 a ton when the animals sold for 6 cents a pound, while the corn was worth but \$14.94 and \$22.72 a ton, respectively, under similar conditions. In the Alabama work the rice polish likewise proved to be more valuable as a hog feed than the corn meal.

Concerning the rice bran experiment at the Alabama station, Duggar writes:

The unusually cold weather of the time, inadequate pens, and the rather unpalatable nature of all the rations, due to the admixture of rice bran, made the rates of growth slow and unsatisfactory. Rice bran was not relished by hogs.

At the Massachusetts station the rice meal and the corn meal proved to be practically equal in feeding value, but the rice meal was the cheaper feed.

MIDDLINGS.

There are mill products in the South, and it will pay the farmers to use some of them along with the corn rather than feed the corn alone. Bran is not acceptable as a hog feed, especially for young animals. It is too bulky to feed to an animal which has a small stomach. The hog has but one stomach and that one is small when compared to the size of the animal. But, as shown below, middlings or shorts can well be used as supplementary feeds to corn.

TABLE 6.—*Experiments with middlings plus corn versus corn alone in feeding hogs.*

Station.	Ration.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Indiana ^b	Corn alone.....	557	\$6.96
	Corn, one-half.....	172	4.73
	Middlings, one-half.....	172	
Wisconsin ^c	Corn alone.....	537	6.71
	Corn, one-half.....	220	6.05
	Middlings, one-half.....	220	
Tennessee ^d	Corn alone.....	1,260	15.75
	Corn, two-thirds.....	407	8.13
	Middlings, one-third.....	203	
	Corn, one-half.....	195	5.36
	Middlings, one-half.....	195	
	Corn, one-third.....	136	5.81
	Middlings, two-thirds.....	274	

^a Price of feeds: Middlings, \$30 a ton; corn, 70 cents a bushel.
^b Bulletin 108.

^c Report, 1885.
^d Bulletin, vol. 15, No. 5.

If the average of the three above experiments be taken it is found that each 100 pounds of pork made cost \$9.80 when corn was used exclusively, and when middlings were used along with the corn 100 pounds was made for \$6.01, which was a saving of \$3.79 a 100 pounds made as a result of introducing some middlings into the ration. With hogs selling at 5 cents a pound, and middlings at \$30 a ton, when corn alone was used only 35.7 cents were realized upon each bushel fed, but when the corn was fed in conjunction with middlings 41.2 cents were realized for each bushel. In many places in the South hogs have been selling for 6 cents a pound, in which case, when corn was fed alone 42.8 cents would be secured for each bushel, but when fed with the middlings the corn would realize, through the hogs, 77.3 cents a bushel. As a result of using middlings the farmer can secure more for his corn than if he had not done so. Still, profits can not

be made as a rule upon hogs when they are fed nothing but corn and middlings; that is, when corn is quoted at 70 cents a bushel and middlings at \$30 a ton and hogs sell at 5 cents a pound live weight. Some other feed or feeds must be secured to go along with corn.

It will be shown later on that pasture crops can be employed so that the feeder can use high-priced concentrates and still realize excellent returns upon them. The problem of high-priced concentrated feeds is ever present in the South, yet the high prices of these feeds need not force the southern farmer to discontinue pork raising. They need only force the adoption of new methods and systems whereby he may be enabled to make pork cheaper than he has ever made it before.

TANKAGE AND MEAT MEAL.

There are at least two packing-house by-products—tankage and meat meal—which should be more generally introduced in the South as feeds to go along with corn. Either one of them would cheapen the ration materially and make corn worth more a bushel as a hog feed. In every case where either one was used in the experiments shown in the following table the cost of gains was reduced below the cost when corn alone was used:

TABLE 7.—*Experiments with packing-house by-products in feeding hogs.*

Station.	Ration.	Pounds offed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Alabama ^b	Corn alone.....	575	\$7.19
	Corn, nine-tenths..... Tankage, one-tenth.....	352 392	5.18
Nebraska ^c	Corn alone.....	583	7.28
	Corn, nine-tenths..... Tankage, one-tenth.....	446 51	6.59
Oklahoma ^d	Corn alone.....	343	4.29
	Corn, nine-tenths..... Tankage, one-tenth.....	290 32	4.27
Tennessee ^e	Corn alone.....	681	8.51
	Corn, seven-eighths..... Meat meal, one-eighth.....	328 468	5.04
	Corn, eleven-twelfths..... Meat meal, one-twelfth.....	401 36	5.74
	Corn alone.....	1,500	18.75
	Corn, 95 parts..... Meat meal, 5 parts.....	485 25	6.56
	Corn, 90 parts..... Meat meal, 10 parts.....	450 50	6.63
	Corn, 85 parts..... Meat meal, 15 parts.....	408 72	6.52

^a Price of feeds: Corn, 70 cents a bushel; tankage, \$40 a ton; meat meal, \$40 a ton.

^b Bulletin 143.

^c Bulletin 107.

^d Bulletin 80.

^e Bulletin, vol. 15, No. 5.

At the Alabama station when corn alone was used only 48.7 cents were realized for each bushel fed, but when a one-tenth part of the corn ration was made up of tankage the sum was increased to 67 cents, assuming that the hogs sold for 5 cents a pound live weight. The average of the work in Nebraska shows that when corn alone was used 60.5 cents were secured for each bushel; when tankage was fed along with corn the returns were 63.5 cents a bushel. In Oklahoma, when corn was fed alone but 41.1 cents were secured for a bushel, but when meat meal supplemented the corn the amount averaged 64 cents a bushel. In Tennessee only 18.7 cents were realized upon each bushel of corn when it was used alone, but when the meat meal was used along with it, its value was raised to 50.3 cents (average of three lots).

COTTON-SEED MEAL.

The deaths that sometimes occur as a result of feeding cotton-seed meal to hogs deter the majority of farmers from using it. It is a feed that, if used at all, must be used in moderation and with judgment. The Bureau of Animal Industry and most of the southern experiment stations have fed it both fermented and sweet—and killed pigs in both cases. There is a risk when it is used for long periods of time, and the man who feeds it should bear in mind this risk. It is not a feed for the farmer to experiment with. He should keep well within bounds when feeding cotton-seed meal to his animals. It is not safe to feed it to hogs, even when making up only one-third of the whole ration, for more than twenty-one days. If it is to be used longer than twenty-one days, the proportion of the meal should be cut down to one-fifth or one-sixth of the entire ration, and even then there is great danger. This danger may be averted somewhat by allowing the hogs plenty of succulent pasture.

Aside from the deaths that may occur, cotton-seed meal is an excellent feed. In fact, it is probably the best feed in the South to go along with corn. It has been charged that it is impossible to keep the hogs eating well when part of the ration consists of cotton-seed meal, but the writer has experienced no trouble in keeping all the animals keen for the next meal when the mixture of corn and meal has been fed as a thin slop, so that it could be drunk rather than picked up and eaten. If it is fed in a doughy condition, the pigs will soon go "off feed."

It will be seen from the following table that when cotton-seed meal is fed along with corn the cost of the gains is greatly reduced—provided no deaths occur:

TABLE 8.—*Experiments in feeding cotton-seed meal and corn to hogs.*

Station.	Ration.	Pounds of feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Alabama ^b	Corn alone.....	590	\$7.38
	Corn, two-thirds..... Cotton-seed meal, one-third.....	303 157	5.75
Texas ^c	Corn alone (fermented).....	868	10.85
	Corn, two-thirds..... Cotton-seed meal (fermented), one-third.....	485 242	9.08
North Carolina ^d	Corn (fermented).....	1,284	16.05
	Corn, four-fifths..... Cotton-seed meal (fermented), one-fifth.....	534 133	8.34
	Corn, seven-eighths..... Cotton-seed meal (fermented), one-eighth.....	446 64	6.37

^a Price of feeds: Corn, 70 cents a bushel; cotton-seed meal, \$25 a ton.^b Bulletin 143.^c Bulletin 78.^d Bulletin 200.

While the expense of making pork is greatly reduced when corn is supplemented with cotton-seed meal, still, with corn at 70 cents a bushel and cotton-seed meal at \$25 a ton, it is seldom that the feeder can come out even when employing them without further supplements. In the Alabama test each bushel of corn when used alone realized 47.5 cents, with hogs selling at 5 cents, but when the corn was used along with cotton-seed meal the value of each bushel was raised to 56.2 cents. The North Carolina work illustrates what poor use hogs will sometimes make of corn when they receive nothing but corn. Assuming the same live price for hogs, only 21.8 cents were realized for each bushel of corn. However, while the regular market price was not secured for the corn, even when cotton-seed meal was fed along with it, still as a result of the addition of small amounts of the meal the value of the corn was doubled in one case and multiplied by $2\frac{1}{2}$ in the other case.

As will be seen later, cotton-seed meal has at least one valuable and safe place in our pork-making operations—a place where it can be fed in large amounts. It can, and should, be used along with corn in a short dry-lot finishing period after the pasture and grazing crops are exhausted. Corn is excellent for finishing up an animal when he is taken off of green crops, but corn with cotton-seed meal is still better, because, first, the gains are made more economically when the two feeds are used together; and, second, the meat and the lard of the animal are hardened more rapidly than when corn is used alone.

PASTURE CROPS TO SUPPLEMENT CORN.

The facts so far presented show one thing clearly—when corn is used alone as a hog feed money is almost sure to be lost. It has also been shown that the feeding value of corn is increased as a result of the

use of almost any supplement. But even when corn is assisted by the supplementary feeds mentioned, there are but few cases where 70 cents is realized for a bushel of corn; that is, when hogs sell for 5 cents a pound live weight. Under present conditions the southern farmer must see his way clear to realize at least 70 cents a bushel upon his corn when fed to hogs before he can look upon the hog business as a profitable one. In short, concentrated feeds of all kinds are upon such a high level of prices that the farmer can not afford to limit the feed of the hog to them alone. Help must be sought outside the concentrated feeds.

The supplementary feeds heretofore mentioned are almost all good and should be used in hog-feeding operations, but the future of profitable hog production in the South depends upon the use of green or pasture crops. It is possible for the southern farmer to have grazing crops practically the year through, and many of the best farmers have them. The southern farmer has, in fact, a decided advantage over the northern farmer in this respect. We have seen that a variety of feeds almost always produced more satisfactory results than one feed. Pastures and green crops can be used to furnish variety better than any other feeds. The southern farmer has grown so accustomed to placing his hogs in a small pen when the fattening period arrives that he has almost forgotten that the hog can make valuable use of many green crops if he be given the opportunity.

PERMANENT PASTURES.

Until the farmer sees his way clear to make a permanent pasture, or has one already made, he should keep out of the live-stock business. It is, in fact, almost impossible to realize a profit upon any kind of stock without good pastures. Therefore, the first thing to be done when one contemplates engaging in stock raising is to establish a pasture.

The South, which is the very section where they can be made easily, is sadly deficient in pastures. No attention has been given to them; it has all been given to cotton. But the southern farmer, if he will devote some time and effort to the subject, can have as good a pasture as was ever seen in Kentucky or Missouri and have that pasture available for grazing more months in the year than is possible in those States. For a permanent pasture there is no combination, either in the North or in the South, that will equal bur clover and Bermuda grass. The Bermuda can be grazed throughout the summer months and the bur clover from January until the Bermuda comes on again. The combination will afford grazing at least ten months of the year. Both plants are permanent after they are once established. To supplement the permanent pasture, temporary pastures should be grown, as cowpeas, peanuts, etc., but no farmer who has stock can afford to be without this permanent pas-

ture combination to be ready for use when the temporary pastures can not be employed.

RAPE PASTURE.

One of the valuable green crops for hogs is rape. It can be sown in the fall after the summer crops are taken off the land, and within seventy days is ready for the hogs to be turned upon it. It is a winter growing crop, or one that can be used between the two summer crops. As a result of its use the land can be kept in use and covered with green vegetation the year round. Several experiment stations have demonstrated its value as a hog feed.

TABLE 9.—*Experiments showing value of rape as a pasture to supplement corn in feeding hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of grain for 100 pounds gain.	Value of 1 acre of rape in terms of corn. ^a
Alabama ^b	Corn.....	294 pounds.....	3.67	26.8
	Rape pasture (first grazing).....	0.18 acre.....		
Wisconsin ^c	Corn.....	205 pounds.....	2.56	31.3
	Rape pasture (second grazing).....	0.205 acre.....		
	Corn alone.....	403 pounds.....	5.03	.....
	Corn.....	282 pounds.....	3.52	45.0
	Rape pasture.....	0.048 acre.....		

^a Assuming that 564 pounds of corn are required to make 100 pounds gain.

^b Bulletin 143.

While rape when planted in the spring will make a summer growth almost anywhere in the South, it is not advisable for the farmer to use it as a summer pasture. Other pastures can be used during the summer months, and the rape can be sown in the fall, after the summer crops are taken off the land, and be ready for pasturing by January. As a rule, lands lie idle throughout the winter months, thus exposing them to the heavy washes, but if rape is used the land can be made to produce a green crop the year round, and at the same time afford the fattening or breeding hogs a good winter pasture.

The experimental work in both Alabama and Wisconsin has shown rape to be an excellent grazing crop to supplement corn. In Alabama the area was grazed twice, as the rape grew up behind the hogs after they had grazed it the first time, and as a result of both grazings it was learned that 1 acre of the rape pasture was equivalent to 61.9 bushels of corn (assuming that 580 pounds of corn will make 100 pounds gain); or, leaving out of consideration the expense of making the crop, each bushel fed at the first grazing was worth 95.8 cents (hogs at 5 cents) and each bushel during the second grazing realized \$1.36. If it cost \$8 to make an acre of rape, and this expense is charged against the gain, the corn during the first grazing sold for 67.8 cents a bushel while that of the second grazing sold for 91.6 cents. In the Wisconsin test 1 acre of rape was found to be equal in

feeding value to 45 bushels of corn, or, estimating, as in the Alabama test, the corn sold for 99.6 cents a bushel when the cost of making the rape crop was not considered, and for 91.9 cents a bushel when the cost is counted against the gain at the rate of \$8 an acre. These results were secured in winter, a time of year when the average farmer is realizing no returns at all upon his land. Thus the farmer is one crop ahead, equal to about 30 bushels of corn.

Rape is not a legume; it will not enrich the soil. Its chief value lies in the fact that it can be grown in the winter time between the main farm crops. It comes off in the spring in ample time for the same area to be planted in any of the general farm crops.

CHUFAS.

The chufa plant is one that can be used for winter grazing also, but it has two disadvantages. One of these is that it must be planted in the spring and occupies the land throughout the whole summer; the other is that while it occupies the ground for a long time it is not a soil improver. Nevertheless many farmers make excellent use of it for pigs that they wish to finish for late spring killing or for the early spring or late winter markets. Some farmers make a practice of planting it upon the same land and at the same time with peanuts, but in alternate rows. This is a good practice. The peanuts are ready to graze before the chufas are matured, so the animals when turned into the field first consume the peanuts and later on in the fall or winter make use of the chufas. The chufa lies in the ground without much loss by rotting. Some of the southern stations have done experimental work in feeding this plant to hogs.

TABLE 10.—*Experiments with chufa pasture for fattening hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of grain to make 100 pounds gain. ^a	Value of 1 acre in terms of corn.
Arkansas ^b	Corn alone.....	379 pounds.....	\$4.73	
	Chufa pasture alone.....	0.168 acre.....		40.3 bushels. ^c
Arkansas ^b	{Corn, $\frac{1}{2}$ ration, plus..... (Chufas and peanuts in alternate rows.....	152 pounds corn..... 0.151 acre.....	1.90	50.6 bushels. ^c
	{Corn, $\frac{1}{2}$ ration, plus..... (Chufas and peanuts in alternate rows.....	163 pounds corn..... 0.147 acre.....	2.04	50.6 bushels. ^c
Alabama ^c	{Corn, $\frac{1}{2}$ ration..... (Chufa pasture.....	305 pounds corn..... 0.41 acre.....	3.81	11.9 bushels. ^c
Alabama ^d	{Corn, $\frac{1}{2}$ ration..... (Chufa pasture.....	216 pounds corn..... 0.149 acre.....	2.71	43.6 bushels. ^c
Alabama ^d	{Corn, $\frac{2}{3}$ (Cowpeas, $\frac{1}{3}$	203 pounds corn..... 101 pounds peas.....	5.06	
	{Corn, $\frac{2}{3}$ (Cowpeas, $\frac{1}{3}$, $\frac{1}{2}$ ration.....	{101 pounds corn..... 51 pounds peas.....		8 bushels corn..... 3.6 bushels peas.
	(Chufa pasture.....	0.23 acre.....	2.53	

^a Price of feeds: Corn, 70 cents a bushel; cowpeas, \$1.50 a bushel.

^b Bulletin 54.

^c Bulletin 143.

^d Bulletin 122.

^e Assuming that 580 pounds of corn are required to make 100 pounds gain. (See Table 1.)

If there is a good crop of chufas it can be expected that good results will be secured, as the above table shows. The results of the Arkansas work were exceedingly satisfactory, the best results being secured when the chufas were planted with peanuts. In two of the Alabama experiments unsatisfactory results were secured, due largely to a poor stand and crop of nuts. In the first Alabama test the corn realized 91.9 cents a bushel where the crop was not charged against the gains, but where the crop at \$8 an acre was taken into account only 31.6 cents were realized for each bushel. But in the second Alabama test the corn sold, through the hogs, for good prices in both cases. It sold for \$1.29 a bushel when the crop was not considered and 98.7 cents a bushel when the expense of the crop was taken into account.

PLANTS FOR WINTER PASTURE.

Many plants, in addition to the ones previously mentioned, can be used for winter pasture. Of course it is more difficult to secure winter than summer grazing, but with the proper use of bur clover, rye, oats, vetch, and crimson clover—all fall sown—there is little trouble to secure grazing areas throughout the whole winter. Bur clover is a permanent pasture and will grow upon almost any character of soil. It occupies the land with Bermuda, but makes its growth in the winter time and dies down when spring appears, and the Bermuda takes its place. Rye, oats, vetch, and crimson clover can be fall sown, following the general summer crops, and be ready for use during the winter and early spring months. The following details regarding winter crops may be of assistance:

TABLE 11.—*Crops for winter grazing.*^a

Crop.	Time to plant.	Amount of seed to the acre.	Number of days from planting to grazing time.
Oats.....	Sept. 1–Nov. 1.....	1½–3 bushels.....	90–128
Rape.....	Sept. 20–Oct. 15.....	4–6 pounds, drilled.....	60–75
Rye.....	Sept. 1–Nov. 1.....	1½–2 bushels.....	90–120
Vetch (with or without oats or rye).....	Sept. 1–Oct. 15.....	1 bushel.....	90–120
Bur clover.....	Aug. 1–Oct. 1.....	{ 15–20 pounds, cleaned..... 136 pounds in bur.....	90–120
Crimson clover.....	Sept. 1–Oct. 1.....	15–20 pounds, broadcast.....	90–120
Chufas.....	Mar. 15–June 1.....	3–4 pecks.....	120–240

^a Alabama Bulletin 143.

PLANTS FOR SUMMER PASTURE.

The pigs which are born in late winter and early spring should be finished for the market, or for home killing, the following fall or early winter. It will seldom pay to keep them through the first winter.

When the pig is sucking the mother both should be given the run of a pasture crop in order that grain may be saved. If the pig is born in late winter, any of the crops heretofore mentioned can be used until the summer crops begin to come on. When green crops and pastures are thus used the pig can be gotten up to weaning time as cheaply, perhaps more cheaply, than he can be carried from weaning time to a finish. Bur clover, which is a part of the permanent pasture system, should, of course, be used during the late winter and early spring months. When the pigs are from 60 to 75 pounds in weight they are ready to begin to finish, and this is the time that the summer pasture crops should be ready to use. This date will be about August.

COWPEAS AS A GRAZING CROP.

Through the use of quick-maturing varieties of cowpeas this plant can be made to be one of the very early summer grazing pastures. If two or more varieties be used, or if the same variety be planted at different dates, the grazing period can be extended over several months. It is, perhaps, best to use other plants, which will be mentioned later, to extend the grazing period. Several of the southern stations have used the cowpea pasture for hogs. The value of this pasturage is shown by the following results at the Alabama station:

TABLE 12.—*Cowpea pasture for fattening hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of 100 pounds gain.	Value of 1 acre in terms of corn.
Alabama ^a	Corn alone.....	586 pounds.....	\$7.33.....	Bushels.....
	Corn, one-half ration.....	307 pounds.....	3.84.....	
	Cowpea pasture.....	0.137 acre.....		36.4

^a Bulletin 93.

The "Unknown" variety of cowpeas was used in the foregoing work. The stand of cowpeas was thin and the rows were about 4 feet apart. When the pigs were placed in the field the leaves were all green and only one-half of the peas had taken on the color of maturity. The other pods were all green, but most of them had attained full size. Even with the thin stand and the rows far apart good results were secured. When the corn was fed alone only 47.8 cents were realized for each bushel, but when cowpea pasture was used in addition to the corn each bushel was worth 71.3 cents (charging the crop at \$8 an acre, fertilizer not considered). When the cost of the crop was not taken into account each bushel of corn proved to be worth 91.3 cents.

At the Mississippi station^a cowpea pasture was grazed without grain. In 1903, although the crop was grown on thin land, 1 acre of cowpeas produced 350 pounds of pork. In 1904 the crop was grown on good valley land and produced 483 pounds of pork to the acre. The hogs were turned on the crop when the peas were ripe. Better results would no doubt have been secured if the animals had been given the run of the field about two weeks before the maturity of the peas.

In 1906 the Mississippi substation^b turned 8 sows with their 30 pigs into a red-clover pasture of $3\frac{1}{2}$ acres on March 20, the red clover having been sown the previous fall. This furnished ample grazing until August 20, when they were turned into a $4\frac{1}{2}$ -acre lot of corn and peas. The 30 pigs were killed out of this pasture November 1 without the addition of any other feed and dressed 117 pounds each, at an average age of 196 days. The pigs ate approximately 6 bushels of corn each. When land rent is estimated at \$5 an acre, corn at 70 cents a bushel, and the cost of seeding the red clover is also taken into account, each pig cost \$4.98.

It is getting to be a common practice in the Middle States, where cowpeas thrive well, to plant the peas in the corn at the last cultivation and graze the hogs on both crops. This method saves a great amount of labor, and the waste of corn is very small indeed if small pigs are given the run of the field after the fattening animals are taken off; in fact, the loss of corn is not as great as is usually the case when hired help gathers it.

SOY-BEAN PASTURE.

The soy bean is a very valuable crop both for hay and for use as a pasture for hogs. The Tennessee station, Bulletin 82, has compared the cowpea and the soy bean as to their habits of growth, yields, etc. According to this bulletin the cowpea has the following advantages over the soy bean: (1) The soy bean may fail to come up through a crust which would offer little resistance to cowpeas. (2) The germination of the cowpea seed is surer than that of the soy-bean seed, which is liable to be spoiled by heating. The cowpea is therefore better than the soy bean for broadcasting, especially on land that is heavy and liable to "bake." (3) The cowpea is much better suited than the soy bean for planting with either corn or sorghum. (4) Cowpea hay is more easily cured by the methods in common use, without the increased loss of either leaves or fruit, than soy-bean hay.

The soy bean, on the other hand, appears more valuable than the cowpea (1) as a grain producer, (2) as an intensive farm crop, (3) as

^a Report for 1905.

^b Bulletin 106.

an early hay or grazing crop (for which purposes the early and medium varieties will produce either hay or seed several weeks ahead of any variety of cowpeas which had been tested at the station), (4) the seed decay more slowly than those of the cowpea when left on the ground, so are better adapted to being pastured off by hogs.

Rabbits feast upon the soy bean while they will not bother the cowpea at all. Therefore the farmer who plants soy beans should plant enough for both himself and the rabbits. The following tests show the value of feeding with corn alone as compared with a combined ration of corn and soy-bean pasture.

TABLE 13.—*Experiments showing value of soy-bean pasture for fattening hogs.*

Station and year.	Ration.	Feed to make 100 pounds gain.	Grain cost of 100 pounds gain.	Value of 1 acre in terms of corn.
Alabama (1907) ^a ...	Corn alone.....	456 pounds.....	\$5.70.....	<i>Bushels.</i>
	Corn, $\frac{1}{2}$ ration.....	157 pounds.....	1.96.....	19.3
	Soy-bean pasture.....	0.28 acre.....		
	Corn, $\frac{1}{2}$ ration.....	437 pounds.....	5.46.....	0.6
Alabama (1908) ^b ...	Sorghum pasture.....	0.57 acre.....		
	Corn alone.....	572 pounds.....	7.15.....	
	Corn, $\frac{2}{3}$ ration.....	130 pounds.....	1.62.....	48.2
	Soy-bean pasture.....	0.164 acre.....		
	Corn, $\frac{1}{2}$ ration.....	111 pounds.....	1.39.....	39.9
	Soy-bean pasture.....	0.206 acre.....		
	Corn, $\frac{1}{4}$ ration.....	54 pounds.....	.67.....	42.3
	Soy-bean pasture.....	0.219 acre.....		

^a Bulletin 143.

^b Not published.

In the first test reported above neither the sorghum nor the soy-bean crops were good. They were both cut short on account of extreme drought at the time of maturing. In the first test the soy-bean field was compared with a sorghum field. The hogs were turned upon the fields at the same time, the beans lacking about two or three weeks of being ready to "pop out," while the juice of the sorghum had sweetened. The soy beans proved to be greatly superior to the sorghum. In fact, the sorghum was practically worthless, while satisfactory results were secured from the soy beans. When corn alone was used 61.4 cents were realized upon each bushel, with hogs at 5 cents; but when the corn was supplemented by the soy-bean pasture each bushel of corn used was worth 98.6 cents (allowing \$8 to make each acre of soy beans).

The soy-bean crop of 1908 was a good one, and of course better results were secured than in 1907. It cost \$8.50 an acre for the station

to put in, fertilize, and cultivate the soy-bean crop. Rent on lands in eastern Alabama is about \$2 an acre. When the cost of making the crop, rent at \$2 an acre, and corn at 70 cents a bushel are all charged against the pigs, 100 pounds of gain were made as follows:

TABLE 14.—*Cost of fattening hogs on soy-bean pasture, including all charges (Alabama experiments of 1908).*

Ration.	Cost of 100 pounds gain.
Corn, $\frac{3}{4}$ ration.....	
Soy-bean pasture.....	3.31
Corn, $\frac{1}{2}$ ration.....	
Soy-bean pasture.....	3.48
Corn, $\frac{1}{4}$ ration.....	
Soy-bean pasture.....	2.96

Even when the interest on the land and the cost of putting in the crop were counted against the gains, pork was still made for less than one-half of what it cost when corn was used alone. Again, when corn alone was used only 48.9 cents were secured for each bushel, but when a three-fourths, a one-half, and a one-fourth ration of corn were used along with the pasture the value of a bushel of corn was raised to \$1.59, \$1.69, and \$3.35, respectively (estimating the cost of making the crop at \$8 an acre).

The Southern Yellow variety of bean was used in all cases. Other varieties can be used if it is desired that the grazing period should be extended. For instance, the Hollybrook variety is ready for grazing two to three weeks before the Southern Yellow, although planted at the same time.

PEANUTS.

Other things being equal, legumes should always be made use of when planning a succession of crops for hogs, on account of their favorable influence in building up soils. Peanuts rank among the exceedingly valuable leguminous hog crops. Many farmers are already aware of their high feeding value, and they are used in those few sections of the South that at the present time are producing more pork than is used at home. As a rule, when a hog-producing section is found in the South, a peanut-growing section is also found. This plant, used along with soy beans, affords a long summer and fall grazing season. It is a very valuable crop for fattening hogs, as will be seen from the table following:

TABLE 15.—*Experiments showing value of peanut pasture for fattening hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of grain for 100 pounds gain.	Value of 1 acre of peanuts in terms of corn.
Arkansas ^a	Corn alone.....	379 pounds.....	\$4.73	<i>Bushels.</i>
	Peanut pasture alone.....	0.079 acre.....	85.6	
	Corn, $\frac{1}{2}$ ration.....	147 pounds.....	1.84	
	Peanut pasture.....	0.146 acre.....	^b 52.9	
Alabama ^c	Corn, $\frac{1}{2}$ ration.....	154 pounds.....	1.92	
	Peanut pasture.....	0.139 acre.....	^b 54.7	
	Corn alone.....	611 pounds.....	7.73	
Alabama ^d	Corn, $\frac{1}{2}$ ration.....	148 pounds.....	1.85	
	Peanut pasture.....	0.45 acre.....	18.4	
	Corn alone.....	560 pounds.....	7.00	
Alabama ^d	Corn, $\frac{1}{2}$ ration.....	177 pounds.....	2.22	
	Peanut pasture.....	0.12 acre.....	56.9	
	Corn, $\frac{2}{3}$ $\frac{1}{2}$ ration.....	{ 107 pounds..... 51 pounds..... } 0.08 acre.....	1.97	
	Peanut pasture.....			
Alabama ^e	Corn, $\frac{1}{2}$ ration.....	162 pounds.....	2.02	^b 27.7
	Peanut pasture.....	0.269 acre.....		
	Corn, $\frac{1}{2}$ ration.....	127 pounds.....	1.59	^b 38.7
	Peanut pasture.....	0.209 acre.....		
Alabama ^e	Peanuts alone.....	0.204 acre.....		^b 50.8
	Corn, $\frac{1}{2}$ ration.....	275 pounds.....	3.44	
	Peanut pasture.....	0.201 acre.....		^b 27.1
Alabama ^e	Corn, $\frac{1}{2}$ ration.....	189 pounds.....	2.36	
	Peanut pasture.....	0.089 acre.....		^b 78.4

^a Bulletin 54.^b Assuming that 580 pounds of corn are required to make 100 pounds gain. (See Table 1.)^c Bulletin 143 (average of three years).^d Bulletin 122.^e Bulletin 83.

All of the above experimental work was done upon poor soils. The producing capacity of the Arkansas soil was about 30 bushels of corn and that of the Alabama soil about 12 to 15 bushels an acre. The Spanish variety of peanuts was used in all cases. If the soil upon which the nuts were grown had been good, better results could have been secured by using some of the larger varieties, but when the soil is poor, as was the case in all of the above work, too many empty hulls are produced when the larger varieties are grown.

In every case in the above table the peanuts were used profitably. In some cases 1 acre of peanuts took the place of 85 bushels of corn. In one case in Alabama 1 acre of peanuts took the place of only 18.4 bushels of corn, but even in that case the nuts were a profitable crop. It will be seen that where there was a fair crop of peanuts each acre was equal in feeding value to from 25 to 40 bushels of corn. The average of the Arkansas work, where both corn and

peanuts were used, shows that the corn sold for \$1.44 a bushel (if it cost \$8 to make the crop), while in the Alabama tests, where corn was used with peanuts, it brought \$1.08 a bushel. In some of the Alabama work the corn returned a value of more than \$1.25 a bushel. It should also be remembered in this connection that these hog-grazing crops do not cost a cent to harvest; the hogs save the expense by consuming the crops in the field. Again, when the hog grazes on the crop there is practically no danger of losing it on account of continued rain at harvesting time.

The above peanuts were all planted from May 1 to July 1. They were ready to graze from 90 to 120 days after planting.

ALFALFA.

Many sections of the South are admirably suited to growing alfalfa. When the farmer is so situated that he can sell alfalfa hay it may not be wise to keep the pasture grazed down with hogs, but at certain times of the year the pasture can be grazed without at all injuring the hay crop. Some farmers are so situated with reference to markets that it would be far more profitable to keep the alfalfa pasture grazed down by hogs than to undertake to make hay of it. It is one of the best pastures that can be secured, since it furnishes a large amount of feed to the acre and the grazing season extends over several months of the year. The value of alfalfa pasture for hogs is shown by the following work at experiment stations:

TABLE 16.—*Experiment station work showing value of alfalfa pasture for hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of grain for 100 pounds gain. ^a	Value of 1 acre of alfalfa in terms of grain.
Kansas ^b	Grain alone.....	371 pounds.....	\$5.56.....	<i>Pounds.</i>
	Grain.....	301 pounds.....	4.51.....	
	Rape pasture.....	0.093 acre.....	753.....	
Nebraska ^c	Grain.....	300 pounds.....	4.50.....	<i>1,544</i>
	Alfalfa pasture.....	0.046 acre.....	.....
Missouri ^d	Corn, 80 per cent.....	366 pounds.....	5.95.....	<i>.....</i>
	Shorts, 20 per cent.....	92 pounds.....	.....
.....	Alfalfa pasture.....	328 pounds corn.....	.....	<i>.....</i>.....
	Corn, 95 per cent.....	17 pounds tankage. }.....	4.44.....	
.....	Tankage, 5 per cent.....	.....	.....	<i>.....</i>.....
	Alfalfa pasture.....	.....	.....
.....	Corn, 90 per cent.....	314 pounds corn.....	.....	<i>.....</i>.....
	Tankage, 10 per cent.....	35 pounds tankage. }	4.62.....	
.....	Alfalfa pasture.....	.....	.....	<i>.....</i>.....
	Corn meal.....	389 pounds.....	6.80.....	
.....	Middlings.....	129 pounds. }	.....	<i>.....</i>.....
	Corn meal.....	401 pounds.....	5.01.....	
.....	Green alfalfa.....	.....	.....	<i>.....</i>.....
	Corn meal.....	243 pounds.....	.....
.....	Skim milk.....	729 pounds.....	5.22.....	<i>.....</i>

^a Price of feeds: Grain, \$30 a ton; corn, 70 cents a bushel; shorts, \$30 a ton; tankage, \$40 a ton; middlings, \$30 a ton; green alfalfa, \$3 a ton; skim milk, 30 cents a hundred pounds.

^b Bulletin 124.

^c Bulletin 94.

^d Bulletin 79.

While the rape pasture in the Kansas test proved to be a good feed to use along with the grain, the alfalfa pasture proved to be a little more than twice as valuable. One acre of rape was equal to 753 pounds of grain, while 1 acre of alfalfa pasture was equal to 1,544 pounds of grain. The pastures were grazed only 98 days, whereas the alfalfa pasture, in the South at least, can be grazed for twice that length of time. When a price of \$30 a ton is placed upon the grain used, an acre of rape pasture proved to be worth \$11.29, while an acre of alfalfa pasture was worth \$23.16.

In the Missouri test the alfalfa was cut and carried to the hogs, which were confined in a dry lot. There were 6 hogs in the lot. They ate 463 pounds of green alfalfa in 102 days. The author, Dean H. J. Waters, writes:

It was not expected that in ordinary farm practice the green material would be cut and fed to the hogs in this manner. At the time the experiment was undertaken, however, it was not feasible to fence off areas of each of these forage crops and graze them. Outside of the extra expense required for cutting and hauling this material to the hogs, it was not considered that they would do so well on this material as if allowed to graze, for when grazing they would be able to select their material and would eat a larger quantity of forage than it was possible to get them to consume in a pen when it was cut and fed to them in the manner described. It is safe, therefore, to assume that our experiments show the minimum advantage of these forage crops, and that in actual practice a larger benefit would accrue from the use of these materials than our experiments show.

SORGHUM.

Sorghum is a green crop well thought of in the South as a feed for swine. Its chief advantage lies in the large yields and the sureness of the crop, there being very few seasons in which it fails. But it must be remembered in planting a rotation of crops that sorghum is not a legume, so that the land will not be made better on account of its having been grown. It should also be borne in mind that corn and sorghum do not make up a balanced ration for animals. They are both low in protein, so if sorghum is to be used at all, the concentrate feed should be partly made up of a feed high in protein, as cotton-seed meal or tankage.

The following table shows that sorghum, when compared with the leguminous crops, is a very poor pasture crop for hogs:

TABLE 17.—*Experiments showing value of sorghum for fattening hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of grain for 100 pounds gain. ^a	Value of 1 acre of sorghum in terms of corn.
Alabama ^b	Corn alone.....	456 pounds.....	\$5.70	
	Corn, $\frac{1}{2}$ ration.....	437 pounds.....	5.46	
	Grazed sorghum.....	0.57 acre.....		0.6 bushel.
	Corn, $\frac{3}{4}$ Cotton-seed meal, $\frac{1}{2}$ ration	{206 pounds..... 103 pounds..... Grazed sorghum.....	3.86	
Alabama ^b	Grazed sorghum.....	0.15 acre c.....		
	Corn, $\frac{3}{4}$ Cotton-seed meal, $\frac{1}{2}$ ration	{314 pounds..... 157 pounds.....	5.90	
	Soiled sorghum.....	0.13 acre.....		{4.3 bushels corn. 123 pounds cotton-seed meal.
	Corn, $\frac{3}{4}$ Cotton-seed meal $\frac{1}{2}$ ration	{181 pounds..... 90 pounds.....	3.39	
	Corn, $\frac{3}{4}$ Cotton-seed meal, $\frac{1}{2}$	{212 pounds..... 106 pounds.....	3.98	
	Corn, $\frac{3}{4}$ ration..... Grazed sorghum.....	{362 pounds..... 1.57 acre.....	4.52	2.3 bushels.
Alabama ^d	Corn, $\frac{3}{4}$ Cowpeas, $\frac{1}{2}$	{374 pounds(mixed)	7.02	
	Corn, $\frac{3}{4}$ Cowpeas, $\frac{1}{2}$ ration.....	{327 pounds(mixed)	6.13	
	Grazed sorghum.....	0.151 acre.....		{2.7 bushels corn. 2.7 bushels cowpeas.

^a Prices of feed: Corn, 70 cents a bushel; cotton-seed meal, \$25 a ton; cowpeas, \$1.25 a bushel.

^b Bulletin 143.

^c Sorghum pasture worthless in this case.

^d Bulletin 122.

The above sorghum was all grazed by pigs averaging about 80 to 100 pounds in weight. They were turned into the field when the seed of the plants were either ripe or in the dough stage. In no case was the sorghum found to be a profitable feed, while in some cases it proved to be a detriment. Corn and sorghum pasture do not produce satisfactory or economical gains. Even when the ration of corn and sorghum was supplemented with a little cotton-seed meal or cowpeas, the results do not compare favorably with those secured when a leguminous crop was used.

In view of the fact that it is very hard work for pigs to graze sorghum, as the cane must be ridden down, it was thought that it might be profitable to place the hogs in a pen and carry the sorghum to them (soiling); so in the second test reported above this method was tried. The results were a little better than when the hogs grazed the crop, but even in this case 1 acre of sorghum proved to be worth but \$4.61. That acre of sorghum could have been made more valuable if it had been made into hay or silage and fed to some other kind of animals.

Sorghum has probably one valuable place as a hog feed—to help carry the brood sows through the summer months economically when

the pastures become short. Sorghum is a bulky feed and is more suited to ruminants than to the hog. The young hog makes no use at all of the leaves and the fibrous part of the stalk; his stomach is too small for such bulky roughage, but older hogs can use roughage to a considerable extent.

It should be remembered that this bulletin reports no sorghum experiments in which the plant was grazed when young; in every case the sorghum was far enough advanced so that the juice was sweet to the taste. Some farmers, however, report success with the sorghum if the hogs are turned into the field when the plant is about 1 foot in height, thus inducing them to eat the tender blades along with the immature juice.

AMOUNT OF GRAIN TO FEED WHEN HOGS ARE ON PASTURE.

It would be of interest to the farmer to know just how much grain to feed along with the pasture crops. Of course the amount of grain fed depends upon the kind of pasture used and whether the animals are just "being carried along" or are being rushed to a finish. One or two stations have undertaken to answer the question. The Utah station has done several years' work in feeding hogs on a pasture made up of mixed grasses, consisting partly of alfalfa. The chief object of the work was to determine the proper amount of grain to use along with their pastures. The results were as follows:

TABLE 18.—*Work at Utah Experiment Station in feeding grain to hogs along with pasture.*

Ration.	Pounds of feed to make 100 pounds gain.	Cost of grain for 100 pounds gain (grain \$25 a ton).	Average daily gains.
Full grain plus pasture.....	374	\$4.67	.21
Three-fourths grain plus pasture.....	354	4.42	.01
One-half grain plus pasture.....	302	3.77	.75
One-fourth grain plus pasture.....	247	3.08	.55

No account was kept of the amount of pasture used by each lot, but it is fair to suppose that those lots which received light grain rations consumed more pasture than did the lots which received a heavy grain feed. But leaving the pasture out of consideration, it is seen that the smaller the amount of grain used the cheaper and slower were the gains.

The Alabama station has done some recent work along the same line with soy beans as the pasture. Accurate account has been kept both of the amount of pasture consumed by each lot of hogs and the

cost of putting in and cultivating the crop. Estimating rent at \$2 an acre, it has cost the station \$10.50 an acre to seed, fertilize, and cultivate a soy-bean crop. The average farmer can make the crop cheaper than did the station, as the farmer can secure labor more advantageously than the station could. The results secured at the Alabama station were as follows:

TABLE 19.—*Work at Alabama Experiment Station in feeding corn to hogs along with soy-bean pasture.*

Ration.	Average daily gains.	Feed to make 100 pounds gain.	Cost of grain for 100 pounds gain.	Cost of grain plus cost of pasture for 100 pounds gain.
Three-fourths corn and soy-bean pasture.....	<i>Pounds.</i> 1.67	130 pounds corn, 0.164 acre pasture. 111 pounds corn, 0.206 acre pasture.	\$1.62	\$3.34
One-half corn and soy-bean pasture.....	1.14		1.39	3.55
One-fourth corn and soy-bean pasture.....	1.30	54 pounds corn, 0.219 acre pasture.	.67	2.97

It is seen that while the cheapest gains were made by the lot receiving the smallest amount of corn, even when the amount of pasture used is also taken into consideration, still there was not a gradual decrease in the cost of gains as the amount of grain was reduced. The second lot, while producing 100 pounds of pork at a cheaper corn cost than the first lot, did not make pork as cheaply as the latter when the area of pasture consumed was taken into account.

Several points must be taken into consideration before one can determine what is the right amount of corn to feed along with pasture when hogs are being finished for the market. First, the condition of the hog at the end of the feeding period must be taken into account. If the animal is to be marketed directly off the pasture crop, it would no doubt be profitable to feed him grain while grazing the pasture on account of the beneficial effect the added grain would have upon the carcass. This is desirable, because the hog which receives but a small allowance of grain in addition to a pasture comes through to the end with a big belly region which makes him dress a low per cent. Although he may gain as rapidly as the animal that receives more grain, he will not be in as acceptable killing condition as will the former, so the butcher will place a lower price upon the pasture-fed animal. Second, the amount of corn at the disposal of the feeder must also receive consideration. When there are large amounts of corn upon the farm to be disposed of, there is no better way to market it than through hogs on pasture, so the problem may resolve

itself into a question of finding a good and high-priced market for corn. When this is the case, it would no doubt be wise to feed the animals liberally of the corn, so that the supply may all be used before the spring months arrive. No farmer can afford under present conditions to sell his corn directly upon the market as corn, even for \$1 a bushel. He should market it through hogs. In the Alabama test from \$1.42 to \$2.82 was secured for each bushel of corn fed when hogs sold for 5 cents a pound live weight. Some farmers hold that the most profitable method is to feed no grain at all while the hogs have the freedom of a good pasture, but it is seen from the above prices realized upon corn that the man who has corn to sell should make more money by feeding it in conjunction with the pasture. Third, the amount of available pasture will have something to do with the amount of corn to feed. If the area of pasture is small for the number of hogs on hand, it would pay to be liberal with the corn in order that the pasture may be extended over as long a time as possible. Fourth, the amount of grain used depends upon the length of time the farmer has in which to get the animals ready for the market. If prices are ruling low, it may be wise to simply carry the animals along slowly until the prices advance. If hogs are selling at a good figure and there is danger of their depreciating in value on account of prices falling, it would be the part of wisdom to finish rapidly through the liberal use of grain.

ROOT AND TUBER CROPS.

It may be stated, as a general rule, that root crops can not be as profitably used for fattening hogs as can some of the crops heretofore mentioned. The South must adopt a system of farming that requires as little labor as possible, and when the root plants are grown much labor must be expended upon them. One of the advantages of stock farming is that it lends itself to handling large areas of land without a corresponding increase in the amount of labor used. If, through the addition of stock to our system of farming, we should materially increase the amount of labor required, the business could not be made a success, as there is but little extra labor to be had. Then again, the effect of the crop upon the soil should never be overlooked. The common root crops now in use are not legumes, so the soil will not be improved as a result of their having been grown. Nevertheless some farmers are so situated and their soils are of such a character that they can probably use root crops to advantage. Some of these root crops have been tested by the southern stations, as shown in the following table:

TABLE 20.—*Experiment station work with root crops for fattening hogs.*

Station.	Ration.	Feed to make 100 pounds gain.	Cost of 100 pounds gain. ^a
Florida ^b	Corn alone.....	999	\$12.48
	Wheat middlings.....	505	
	Sweet potatoes.....	505	
	Wheat middlings.....	163	
	Peas.....	122	
Alabama ^c	Cassava.....	325	
	Sweet potatoes, $\frac{1}{2}$	1,000	
	Cowpeas (ground), $\frac{1}{2}$	334	
	Corn, $\frac{1}{2}$	200	
	Cowpeas (ground), $\frac{1}{2}$	200	

^a Price of feeds: Corn, 70 cents a bushel; middlings, \$30 a ton; potatoes, 25 cents a bushel; cassava, 20 cents a hundredweight.

^b Bulletin 55. ^c Bulletin 93.

Very seldom are satisfactory results reported where root crops are used; the results given above show root crops to be of little value as a hog feed.

At Cornell ^a the Irish potato was fed both cooked and raw. A little grain and skim milk were fed in addition to the potatoes. Over 400 pounds of potatoes were eaten, but the pigs failed to make progress and the test was closed.

At the Central Experimental Farm,^b Ottawa, Canada, reasonable results were secured when cooked potatoes were used, but raw potatoes produced practically no gains.

With regard to the Alabama test reported above, Duggar states:

The results show that under the conditions of this experiment 1 pound of corn was worth much more than 3 pounds of sweet potatoes. If corn were worth 50 cents a bushel these results would give sweet potatoes a value considerably below 17 cents. Probably 10 and 12 cents per bushel would be a close estimate of the nutritive value of a bushel of potatoes fed with cowpeas in the proportion employed in the experiment. It is plain that sweet potatoes could not profitably be grown, stored, and fed to hogs, even if each bushel could be converted into pork worth 10 to 15 cents. This does not imply that sweet potatoes can not be profitably employed as a food for hogs. But a profit is possible only by saving the expense of harvesting—the heaviest single item of expense in sweet-potato culture. If the hogs do the rooting, the sweet potato is doubtless a cheaper food than corn on some sandy soils that yield ten to fifteen times as many bushels of sweet potatoes as of corn.

Duggar's subsequent experience in feeding hogs on sweet potatoes in the ground did not prove to be profitable. He writes: "The potatoes were not eaten with relish, and after being rooted up they were left upon the surface, some of them remaining there until they decayed."

^a Bulletin 199.

^b Bulletin 33.

CROP SUCCESSION FOR HOG FEEDING.

There has been no effort to present in the preceding pages all of the summer growing plants that can be used for grazing hogs. Only a few of the most prominent ones have been brought to the reader's attention. The farmer who knows his own conditions and his own soil can introduce into his cropping system many plants that have not been mentioned at all. The following table gives data concerning a number of suitable plants.

TABLE 21.—*Summer and fall growing crops suitable for hog grazing.^a*

Crop.	Time to plant.	Amount of seed to the acre.	Number of days from planting to grazing time.
Alfalfa.....	Feb. 25-Apr. 1.....	15-25 pounds.....	75-90
Chufas.....	Mar. 15-June 1.....	3-4 pecks.....	120-150
Cowpeas.....	May 1-July 10.....	1 bushel (drilled), 14 bushels (broadcast).....	75-90
Soy beans.....	Apr. 1-June 30.....	1 bushel (drilled), 14 bushels (broadcast).....	90-120
Japan clover.....	Mar. 1-Mar. 15.....	24 pounds.....	60-75
Oats.....	Feb. 1-Mar. 20.....	14-3 bushels.....	75-90
Peanuts.....	May 1-July 1.....	1-2 bushels (not hulled).....	90-120
Rape.....	Mar. 1-Mar. 31.....	4-6 pounds (drilled), 9-10 pounds (broadcast).....	60-75
Sorghum.....	Apr. 1-July 1.....	14-2 bushels.....	60-90
Velvet bean.....	May 10-June 20.....	14 pecks (in drills).....	100-130

^a Alabama Bulletin 143.

FINISHING HOGS AFTER PASTURE CROPS ARE EXHAUSTED.

The majority of the farmers of the South who make use of green crops for fattening hogs dispose of the animals when the crops are exhausted without finishing them upon grain for a short period in a dry lot. There is a time when the hog should be penned up in a lot and fed grain alone, but that time is not at the beginning of the feeding operations. He should be penned up after the pasture crops are gone and fed grain alone for a few days before slaughtering or marketing. There are several reasons for following this plan. First, the hog after coming off the pasture is in just the proper condition to make gains economically and rapidly for a short time. He is in excellent health, active, and, as a rule, his frame is not covered with as much fat as it should carry. The pasture has tended to develop his frame at the expense of fat, especially if he is a young animal. After he is fed in a pen from twenty-five to twenty-eight days he looks better, and is better, than when he came off pasture, and is actually worth more to the consumer or butcher as he is fatter and will dress out a higher percentage of good marketable meat than if he had been sold directly from the pasture. Second, when hogs have been grazed

upon peanuts, soy beans, and certain other green crops, the meat and lard have become soft, which makes the animal objectionable to the butcher as well as for home consumption. This soft meat can be hardened very materially if the hogs are fed upon grain for only a short period after the crops are exhausted.

What shall the animal be fed during this short dry-lot finishing period? Corn is good; corn in combination with cotton-seed meal is better and is cheaper than corn alone, as the addition of cotton-seed meal to the ration renders the meat hard more rapidly than when corn alone is used. If the animals are to be fed not more than twenty-one days in this finishing period one-third of the total ration may be made up of cotton-seed meal. If it is likely that the last period will be extended over more than twenty-one days the proportion of cotton-seed meal should be cut down to one-fifth or one-sixth of the whole ration, and the finishing period extended not beyond five weeks in all.

INCREASE IN SOIL FERTILITY DUE TO GRAZING HOGS.

Inasmuch as green crops suitable for hog feeding can be maintained in the South practically every month in the year, it is possible for the southern farmer to make more money than the northern farmer upon hog-producing operations, and the profits made are in proportion to the amount of green crops used. But in addition to making ready money on the hogs themselves the farmer who grows leguminous crops and grazes them off with hogs has a fertilizer factory on his own farm. In 1898 the Arkansas station^a grazed hogs upon areas of peanuts, chufas, and soy beans. The following two years the land was planted in cotton, and data were collected to determine what effect this grazing might have upon cotton yields. The results per acre were as follows:

TABLE 22.—*Fertilizing effect of crops grazed by hogs.*

	Seed cotton, 1899.	Seed cotton, 1900.	Average yield of seed cotton, 1899-1900.	Average per cent increase in seed cotton due to grazing and growing crop.	Value of increase per acre each year (lint 11 cents, seed 60 cents).
Cotton following peanuts grazed by hogs.	<i>Pounds.</i> 1,771	<i>Pounds.</i> 1,134	<i>Pounds.</i> 1,452.5	61.1	\$22.81
Cotton following soy beans grazed by hogs.	1,588	1,020	1,304.0	44.6	16.35
Cotton following chufas grazed by hogs.	1,200	981	1,090.0	20.9	7.68
Cotton following corn not grazed.	1,005	798	901.5	.....	.....

^a Bulletin 88.

The effect upon the soil of growing a legume and then grazing it off with hogs is remarkable; for instance, in the case of soy beans and peanuts the increased yield of cotton was 44.6 and 61.1 per cent, respectively. The effects of growing these crops and grazing them off does not stop with the cotton crop grown the year immediately following the grazing. The data show that the increase over the corn lot was still considerable in the second year.

Of course in the cases where peanuts and soy beans were used the increased cotton yields were not due entirely to the grazing; part of the benefits were due to the fact that the crops were legumes, the effect of which would be to place nitrogen in the soil for the use of subsequent crops. But with the chufa pasture we have a case where the increased cotton yields can be attributed only to the grazing and the supplementary grain fed, as the chufa plant is not a legume. In this case the increased cotton yields for the average of the two years following the chufas was 20.9 per cent over the cotton crops which had followed a corn crop without being grazed off by the hogs. It is therefore apparent that a farmer can expect to get more cotton when it is planted on an area where hogs have grazed or where peanuts, soy beans, or other legumes have been grown than he can secure from an area where hogs have not been grazed.

CONCLUSIONS.

1. Hogs can be raised at a profit in the South, and southern farmers should raise more of them.
2. Hogs can not be raised profitably on corn alone.
3. While pork can sometimes be made at a profit when corn is supplemented with nothing but a concentrated feed, still it is not wise to use concentrated supplements alone.
4. Hogs can be produced cheaper when pastures are used along with the grains than when grains are used alone. By means of pasture crops pork can be made cheaper in the South than it is possible to make it in the corn belt.
5. The advantages arising from the use of pastures are:

Pork costs only one-third to one-half as much when pastures are used as when concentrated feeds alone are used.

The soils are improved very materially as a result of growing the legumes for the hogs and feeding extra grains to the animals.

The crops are harvested (through the hogs) without danger of loss from rains and without expense.

The hogs are under favorable health conditions; therefore losses from disease will be lessened